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ABSTRACT

This issue of "Tap into Learning" continues an exploration of ways computers can support student learning. As in previous issues, a constructivist learning theory is used as a framework for discussion. This issue examines the notion that social interaction plays an important part in the construction of knowledge. Articles include: "Communication: A Key to Learning," "Connections along the Flyway," "Making It Happen in Your Classroom," "What Does Constructivist Theory Tell Us? The Butterfly Project," and "Communicating on the 'Net: A Selection of Internet Sites." The following six principles that make up a framework for constructivism are outlined: "Learners bring unique prior knowledge and beliefs to a learning situation"; "Knowledge is constructed uniquely and individually, in multiple ways, through a variety of authentic tools, resources, experiences and contexts"; "Learning is both an active and a reflective process"; "Learning is developmental. We make sense of our world by assimilating, accommodating, or rejecting new information"; "Social interaction introduces multiple perspectives on learning"; and "Learning is internally controlled and mediated by the learner." (AEF)

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Communication: A Key to Learning.

Tap into Learning, Volume 2, Number 1, Winter 2000.

Written by Sharon Adams

Mary Burns, Editor

Technology Assistance Program (TAP)
Southwest Educational Development Laboratory

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TAP into Learning

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Communication: A Key to Learning

Welcome to *Tap into Learning*. In this third issue we will continue our exploration of ways computers can support student learning. As in our previous issues, we will use constructivist learning theory as a framework for discussion. In this issue we will examine the notion that social interaction plays an important part in the construction of knowledge.

While we know that learning takes place individually, an important part of forming ideas and understanding of the world occurs through interaction with other individuals. In fact, some learning theorists believe that social interaction is an essential part of cognitive development. These *social constructivists* view the learning context as one of the defining features of a learner's experience.[1]

What does that mean for a teacher? In classrooms, social discourse is realized in many ways including class discussions, small group conversations, pairs of students working together to complete a project, formal debates, and spontaneous questions. These conversations are important for individuals who are forming their understanding. In the classroom, discourse serves several functions—it helps learners test and refine their ideas, it introduces multiple perspectives, and it helps individuals negotiate limits on personal ideas and theories.

If social discourse is used effectively, it can be a powerful method of encouraging student engagement and growth.

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A Framework for Constructivism

- Learners bring unique prior knowledge and beliefs to a learning situation.
- Knowledge is constructed uniquely and individually, in multiple ways, through a variety of authentic tools, resources, experiences and contexts.
- Learning is both an active and a reflective process.
- Learning is developmental. We make sense of our world by assimilating, accommodating, or rejecting new information.
- **Social interaction introduces multiple perspectives on learning.**
- Learning is internally controlled and mediated by the learner.

These six principles were distilled by the staff of SEDL's Technology Assistance Program from a variety of sources on constructivism, brain research, and education research as well as staff members' experiences as teachers, learners, and observers in classrooms.

To learn more about SEDL's Technology Assistance Program, visit our Web site at http://www.sedl.org/tap.

Communication: A Key to Learning

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Conversations with the World

How can computers support social discourse focused on learning? First, the computer can link learners electronically through email and the World Wide Web. There are thousands of online discussion groups, and many of them have direct connections to classroom curricula. The resource list on pages 7-8 provides contacts for online discussion groups. There are different ways to structure online experiences, and a teacher will want to pick the one that best fits the class instructional objectives. As in any classroom endeavor, curriculum goals will dictate the structure of an online relationship.

- **Individual communication.** Teachers often start their online classroom experiences with an electronic version of penpals. A simple greeting is all that is needed for the first step of connecting with other students. These connections can be rewarding and fun for students, particularly those who have not experienced the global reach of an electronic network. As a support to curriculum goals, an online conversation might be particularly relevant for social studies classes (international connections provide new perspectives to issues reported on the evening news); foreign language classes (electronic conversations in a second language are spontaneous and colloquial); or human development classes (sharing glimpses of family and youth culture from other schools in the nation can spark interest and exploration).

- **Talking with an expert.** In a bit more ambitious vein, a teacher may want students to connect with an expert who can share perspectives or expertise. Such electronic conversations add depth to a study unit and build students' interest. One teacher had her students communicate with a cancer survivor to hear that person's story about the disease. A middle school science teacher connected with the local water quality authority during the class's wetlands unit. To be sure these relationships unfold in a productive way, the teacher should investigate the expert's specialty and style to assure there is a good match with the students. Several electronic conversations with the expert before connecting with the students can help avoid miscommunication. Some professionals, while extremely well versed in their subject area, are not skilled in presenting information to nonspecialists or to young people.

- **Learning with other classes.** Another way to use electronic communication is to pursue a project with another class. The global reach of the Internet is particularly helpful for questions that span distance and time. For instance, classes that are located on the migratory paths of particular birds or insects can join cooperative observations of these animals' travels during a season. Weather connections also lend themselves to collaborative gathering and sharing of natural data. The Journey North project <http://www.learner.org/jnorth/> is a web-based collection of reports on migratory patterns of birds, insects, and mammals in North America. This electronic logbook gathers comments from classroom groups as well as nature lovers and scientists.

  Another example is Learning Circles, which are interactive partnerships focused on a particular project. Learning Circle participants come from schools around the world and commit themselves to 14-week sessions. See more about Learning Circles at <http://www.iearn.org/iearn/circles/>.

- **Sharing with others.** Stepping into a larger arena, class members may want to share their ideas or work with anyone who has similar interests. Students in humanities classes have worked with others around the globe to develop shared collections of poetry, fiction, and essays. They post their work and encourage comments and

critiques from others in the electronic audience. For example, see Poetry Pals, <http://www.geocities.com/Enchanted Forest/5165>. In mathematics, a discussion of interesting geometry problems has prompted competing solutions among the participants in a Geometry Forum <http://forum.swarthmore.edu/> sponsored by Swarthmore College. Electronic discussion groups are also great ways to practice written skills in a foreign language, with students who are struggling with a new language or with native speakers who would like to reciprocate in English. See the EPALS site, <http://www.epals.com/index.html>.

- **Publishing to the world.** With the advent of the Internet, classroom computers can connect students to information and conversations. At the receiving end of the pipeline, schools benefit from an extraordinarily large collection of information. Research sources are no longer restricted to the printed offerings available from the school library collection and opinions on issues are not limited to the voices in a local community. As well as extending the range of what comes into the classroom, these electronic avenues present a wider audience for work that goes out of the classroom. The computer's potential for forging connections and linking scattered people across the globe has given students an exciting arena for sharing their work. No longer are they confined to the four walls of a room, or indeed, to the limits of a town boundary. Publishing products that include graphics, text, sound, and motion can be accomplished by anyone who wants to learn the steps for creating a presence on the World Wide Web.

Talking in Class

Conversations with others around the world are exciting, but computers can also encourage social interaction within the classroom. Provided the opportunity, students like to share strategies and talk about their learning. Teachers can structure activities so the computers encourage student collaboration. For example, in a 6th grade English class, a teacher assigned pairs of students grammar problems that were posed on a computer template. The student teams took turns at the classroom computers, working on the assignment. The students discussed their examples and corrected each other's mistakes. Rather than isolating individual students, computers were catalysts for discussion about the lesson's content.

One study[2] that observed several high school business education classes, noted that students who worked on computers to complete an assignment, interacted up to three times as often as others in the same class who were independently completing a similar assignment at their desks. These interactions were described as "academic"—the students were not catching up on their social life, they were talking about the assignment.

Teachers' Conversations

It isn't only students who benefit from social discourse. Communication tools like email, listservers, bulletin boards, and chat groups help teachers exchange lesson plans and teaching strategies and create professional communities. A study[3] of instructional environments that support successful use of computers cited the importance of a social network of computer-using teachers within the same school. (Not surprisingly, other factors included organized staff development and a full-time computer coordinator, as well as smaller class sizes and funds for software acquisition.) Just as students benefit from talking about problem-solving strategies, so do teachers need professional feedback and brainstorming to address problems of management, strategies, and discipline.

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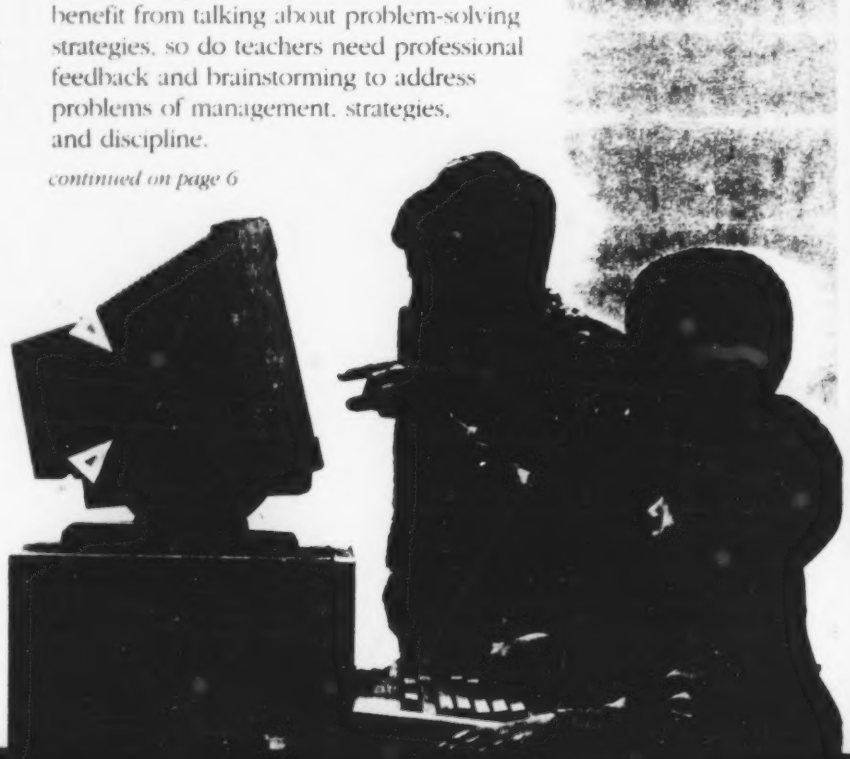


Connections Along the Flyway

When Jennifer Anderson saw the Monarch butterflies drifting across a parking lot in her north Arkansas town, she began thinking about their extraordinary journey. She had seen pictures of people and trees covered with the insects in their roosting place in central Mexico, but here were 50 of them fluttering above her head. Where were they coming from and how far had they been flying?

The computer in her middle school classroom beckoned as she continued to think about the Monarchs. Entering the term "Monarch butterflies" into several Internet search engines yielded a variety of websites, some helpful, some not. But most interesting were several collaborative projects that used the Internet as a collecting point for data from around the world. One tracking database was called Journey North <http://www.learner.org/jnorth/>.

It recorded sightings of several different migratory animals, including Monarch butterflies as they traveled their seasonal routes. Another, InsectWorld, was sponsored by Environet, an environmental education project sponsored by Simmons College in Boston <http://earth.simmons.edu/environet/enviro_info.html>. Environet databases also included CoyoteHowl (to determine the distribution of coyotes across North and Central America) and RoadKill (mapping fragmented wildlife corridors).

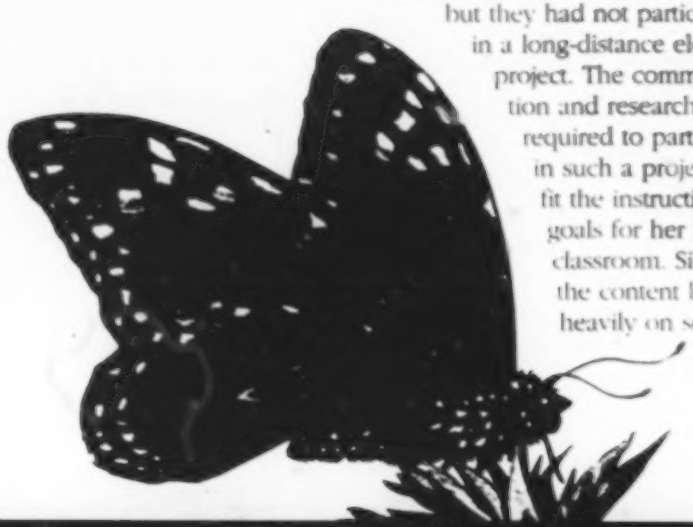
Ms. Anderson was delighted. Students in her 8th grade English class had used the Internet as a source for information, but they had not participated in a long-distance electronic project. The communication and research required to participate in such a project easily fit the instructional goals for her English classroom. Since the content leaned heavily on science topics, she mentioned her ideas to Mr. Hooks, the life science teacher down the hall. The curriculum included the study of natural patterns and migration and a mapping project of Monarch migration patterns fit perfectly. The teachers began to plan the project for next year's class.

Mr. Hooks turned to another Internet project, the Monarch Watch from the University of Kansas and the University of Minnesota <http://monarchwatch.org/>. The entomologists at those universities were tracking the butterflies' flight paths and they needed help tagging the Monarchs. Mr. Hooks bought a $12 tracking kit from the website which included detailed instructions for safe capture and tagging. The study requested that the students record detailed information about times, locations, and weather conditions that occurred during their Monarch sightings.

Meanwhile, Ms. Anderson scouted for other classrooms that were embarking on a similar activity. She tried several teacher locating websites including one sponsored by Classroom Connect <http://www.connectedteacher.com/teacherContact/search.asp> and another by AT&T <http://www.att.virtualclassroom.org/>. Her time paid off—she began corresponding with a teacher from an 8th grade class in Texas who was planning a similar activity in the fall.

When the school year began, Mr. Hooks' students used their textbooks, the school's library resources, and the Internet to learn about the spectacular insects—the length of their routes, their life cycle and how migration fits into that cycle, comparisons with other insects and other migrating animals around the world. The students studied various facts about the creatures, observed specimens in laboratory sessions, and wrote lab reports from the information they gathered.

The students were impatient for a sighting. They knew that the butterflies would be leaving their northern homes



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in the early fall and should be visible in Arkansas by mid-September sighting. Their corresponding school in Texas, many miles to the south, had already sighted some of the butterflies and posted their report to the Journey North website. Finally, late in the month, the students saw a group of Monarchs and reported their data to Journey North. It was the first recorded sighting from Arkansas marked on the Journey North map. Using their kits from the Monarch Watch group, the students captured, tagged, and released several of the butterflies.

In Ms. Anderson's English class, students were working on their research project. The Internet's resources helped them understand the context of the Monarch story in relation to other issues. For example, several websites reported a debate about possible ill effects to migrating Monarchs from the pollen of genetically engineered corn. Starting with a news report from a broadcasting network, students delved further into web page discussions sponsored by university scientists, genetics engineering firms, nature groups, amateur entomologists, and government agencies. Some sources were passionately opposed to genetic engineering while others were assertive in their support of the technology. Email addresses at the bottom of two different sites provided connections with specialists who were immersed in the issue and provided substantive information.

By the end of the unit, many of the students had progressed from a mild curiosity about Monarch butterflies to an active enthusiasm for the work of environmental scientists. The work had helped them understand the connections between social and cultural issues and natural phenomena. Several student-authored stories emerged from their work, which Ms. Anderson posted on the class's web page. The Internet had supplemented the school's content resources and enriched the classroom conversations. The students contributed to a national online database and their email conversations extended their ideas and perceptions to others outside their community. Connections with another classroom let them compare their experiences with peers in another state. All these examples allowed the students opportunities to communicate their ideas, test their theories, and share their perceptions. Such experiences are essential to the growth of ideas and the development of skills that support learning.

Spring migration map at <http://www.monarchwatch.org/>

Fall migration map at <http://www.monarchwatch.org/>

The Monarch Project illustrates several ways computers can be used to communicate within and outside the classroom. There are many more things teachers can do to exploit the potential of the computer as a collaborative tool. Dr. Judi Harris, professor of instructional technology at the University of Texas, has created a helpful framework that outlines some obvious and not-so-obvious examples of electronic collaboration. Her 1997 book, *Virtual Architecture*, provides a rich collection of Internet sources that can help teachers and their students communicate and work with others outside the classroom. Dr. Harris's schema of online collaborative projects includes examples of projects in three major areas:

- **Interpersonal Exchanges** (which include keypal exchanges, telementoring projects, and question-and-answer activities)
- **Information Collection and Analysis** (including database creation and pooled data analysis), and
- **Problem Solving** (with such examples as simulations and peer feedback activities). There are more examples, and complete explanations of the categories in the book.

Virtual Architecture by Judi Harris. Available from the International Society of Technology in Education. 1-800-336-5191.

A companion website provides helpful links. <http://coat.cc.utexas.edu/~jbharris/Virtual-Architecture/>

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Making it Happen in Your Classroom

Experienced teachers who use technology as a collaborative tool use a variety of strategies to help their students manage their computer time. Here are several practical suggestions that may work in your classroom.

Working in groups. Letting students work in collaborative groups is an excellent way to encourage academic conversations. Students on a work team must talk to each other about their project, and a computer can enhance those conversations. To help students learn computer skills, some teachers like to assign a mentor in the group who can assist but can not touch the mouse or keyboard while other group members are working. That structure ensures computer time for the less experienced user and lets the more experienced student share his/her knowledge. Other teachers prefer to organize students in working pairs and let them share time with the mouse and keyboard while they teach each other. Regardless of the management structure, as students become comfortable using the computer, they will begin to talk about their work as they create their products.

Time Management. With limited classroom time, many teachers structure computer time by placing a timer at the computer and posting a schedule for student use. Students are vigilant about enforcing the schedule so they are sure to get equal time with the technology. You will need to determine how much time is practical for computer use in your classroom. In some classrooms, the teacher sets aside 10 minutes per student while they are beginning their computer work. These schedules may need to be adjusted as students become more proficient and use the computers regularly to complete their work.

Asking Questions. Completing a project is great, but did the students learn anything from the experience? Teachers can use email to structure electronic classroom conversations and introduce questions that challenge students' understanding. Virtual discussions or electronic journal assignments create an opportunity for individual reflection outside the dynamics of group collaboration. Some email correspondence should go directly to the teacher while the responses to other questions might be posted to the entire class.

Communication: A Key to Learning

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Electronic connections with professional communities can transcend local politics. It is enlightening to join a conversation about teaching issues that are similar from Maine to California. Discussion groups, email, chat sessions, listservers are all avenues for conversations about how learning is occurring in the classroom and ways teachers can use technology to encourage that learning.

Finding Meaning

It is a challenge for young people to make sense of the information and experiences that surround them. Their lives are filled with family activities, community events, media messages, and school responsibilities. As students mature they may also be balancing demands of work with thoughts about their future. How can the lessons offered in their classrooms connect with the other parts of their lives? How can teachers structure lessons that help students make connections with the content? One strategy is to encourage conversations within the classroom and with others in the world through electronic communication. Using these modern networks, computers can help students forge connections and create personal meaning from their experience.

1 For more information about the social constructivist view of learning, the following provides an overview: Duffy, T.M., and Cunningham, D.J. (1996). Constructivism: Implications for the design and delivery of instruction. In D.H. Jonassen (ed.) *Handbook of Research for Educational Communications and Technology* (pp.170-198). New York: Simon Schuster Macmillan. Most of the work in social constructivism references the work of the Russian psychologist, Lev Vygotsky. His posthumously published book might be of interest: Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

2 Din, F.S. (May, 1996). "Computer-assisted instruction, students' off-task behavior and their achievement." *Education and Treatment of Children*, 19(2), 170-182.

3 Becker, H.J. "How our best computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools." *Journal of Research in Computing in Education*, 26(2), March, 1994.

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What Does Constructivist Theory Tell Us? The Butterfly Project

Looking through the lens of constructivist learning theory, how did the activities in Ms. Anderson's and Mr. Hook's classrooms support student learning?

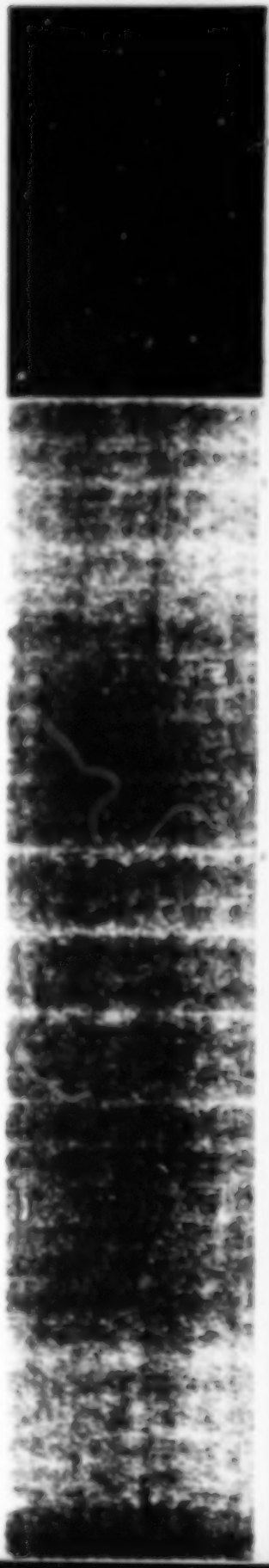
Social interaction with multiple perspectives

During the butterfly project the students in both classes made many connections. They spoke with or wrote to other students and the teacher in the Texas classroom, with the Monarch Watch project staff, through email connections from the various research websites, and with the other participants on the Journey North database. These individual perspectives helped each student build a personal understanding of the project.

The teachers also provided opportunities for social interaction within the classrooms. For some of the activities, student teams worked together to complete a product—a classroom management strategy that requires cooperation and communication between team members. Also, classroom discussions provided an important forum for communication.

During the discussions, students were expected to share ideas about the project, pose questions and contribute theories about its content, and make projections about its outcome. These conversations supported the development of ideas and helped the students add to their personal experiences. When discussions centered on thoughtful questions, the students could compare their understanding with their teachers' viewpoints and those of their classmates to see if their ideas fit or conflicted with others in the classroom.

When the students joined Journey North's database, they became part of an ongoing research project—the tracking of Monarch flyways. Their observations and reports for Monarch Watch contributed to a study that is currently used to increase the world's knowledge base about the insects. It is not a "pretend" activity, but a real one that is accessible through computer technology. Authentic experiences such as these take schoolwork out of the abstract realm and give learners a context for understanding.



Communicating on the 'Net: A Selection of Internet Sites

EPALS Classroom Exchange
This network of students and classrooms from over 100 countries offers its resources in English, Spanish, and French language versions. It has a useful search engine that helps participants find the appropriate project or student group for correspondence. This is a very helpful site if a class wants to connect electronically. <http://www.epals.com/index.html>

Ex Nihilo Online Writing Workshop
A nice collection of writing samples from talented middle school students. This site includes a forum to share and comment on poetic, expository, and narrative writing. Although some of the planned discussion areas were not ready for viewing at our publication date, the Author's Chair and Gallery are available. <http://www.jps.net/gmreed/writing/mainwrit.htm>

Geometry Forum
This site has been posting a Problem of the Week since 1993, and all problems and student conversations from those years are posted in its archives. Take a look at the collaborative projects section <http://forum.swarthmore.edu/daley/projects.html>, which lists ongoing projects, keypal opportunities and sources for projects. The Forum supports mathematics, science and interdisciplinary classrooms for grades K–12. <http://www.forum.swarthmore.edu/>

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To contact the Technology Assistance Program, please call us at 1-800-476-6861 or write to us at Technology Assistance Program, SEDL, 211 East Seventh Street, Austin, TX 78701. You may also send us e-mail by writing to Vicki Dimock, Program Manager <vdimock@sedl.org>.

TAP into Learning is a collaborative effort by the staff of the Technology Assistance Program. This issue was written by Sharon Adams.

Mary Burns, Editor

To learn more about SEDL's Technology Assistance Program, visit our Web site at <http://www.sedl.org/tap>.

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Communicating on the Net

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Global SchoolNet Registry

The Global SchoolNet Foundation, a group dedicated to connecting schools around the planet, has compiled an extensive database of collaborative projects that can be searched by grade level, curriculum area, technology focus, and level of project. <http://www.gsn.org/pr/index.cfm> This website also provides a list of online discussion groups and electronic journals. <http://edweb.gsn.org/lists.html>

The Great Tree Hunt

Students from around the world investigate their local trees and forests and submit descriptions, drawings, measurements, poems, images, and observations to this website. The contributions are used for The Great Tree Hunt Challenge, in which students use website clues to identify a particular tree or forest. The school with the best score is awarded a donation for garden improvement. (Suggested for grades 3–8.) <http://www.highlands.vic.edu.au/great_trees/>

I*EARN

This project supports international teams of 6–8 classes who collaborate on interdisciplinary activities. Project themes have included Places and Perspectives (geography, culture, government, and history), Computer Chronicles (journalism, computer publishing, English), and Energy and the Environment (science and social studies). The projects usually last 3 or 4 months, allowing students time to explore the content, then collect and publish their work. <http://www.iearn.org/iearn/>

Kidlink

The Kidlink organization, staffed mostly by teacher and parent volunteers, supports Internet dialogue among youth of the world. The site uses 7 to public mailing lists for conferencing and a private network for real-time interactions (like chats). It also provides an online art exhibition site. <http://www.kidlink.org>

Listserv

CataList is the official catalog of listserver lists. This website is maintained by L-Soft international, Inc., the holders of the Listserv trademark. <http://www.lsoft.com/lists/listref.html>

Poetry Pals

This publishing project for K–12 classrooms offers an international collection of student poems. Class poems or individual poems can be included in the site, or the class may post its poetry on its local server and link to this collection. <http://www.geocities.com/EnchantedForest/5165/>

Teacher and Student Connections

Since 1995, *Classroom Connect* has been publishing materials for teachers who want to connect with cyberspace. The website offers opportunities for student collaboration (including electronic treks to Africa, Asia, and the Galapagos Islands) as well as a free professional online community called the Connected Teacher. This is a commercial site, so many of the activities are dependent on a subscription rate. Take a look and see if the menu of possibilities tempts you to pay for the experience. <http://www.classroom.com/>

Teacher Chatboard

For a free-wheeling collection of teacher conversations, take a look at this site, which is a true chat environment. The comments are spontaneous and quick—there are numerous postings every day—and they range from classroom tips to jokes and personal musings. <http://teachernet.chat/>

Technology Assistance Program (TAP)

The TAP website lists a variety of resources for teachers interested in using technology in their classrooms. The collaboration page offers many options for classroom online collaboration. <http://www.sedl.org/tap/collaboration.html>

Think Quest

This international Internet contest, created by Advanced Network and Services, Inc., offers teams of students, ages 12 to 19, prizes that total over $1,000,000. The prizes include $25,000 scholarships for student team members. ThinkQuest Jr. is available for students in grades 4 to 6. Contest winners are projects that use the Internet as a powerful source of information and a collaborative tool. <http://www.advanced.org/thinkquest/>

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